

Status and plans for TRIUMF beam test

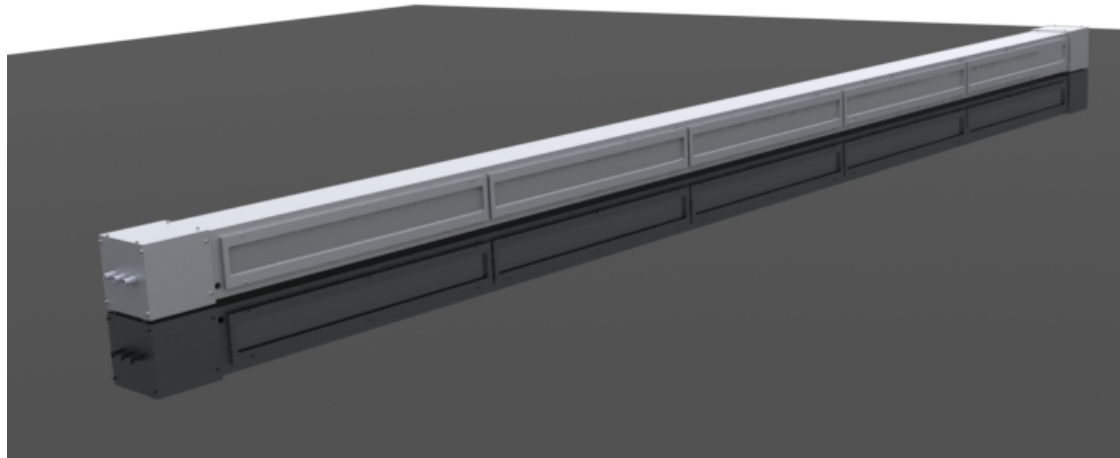
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13-Sep-2011

Goals

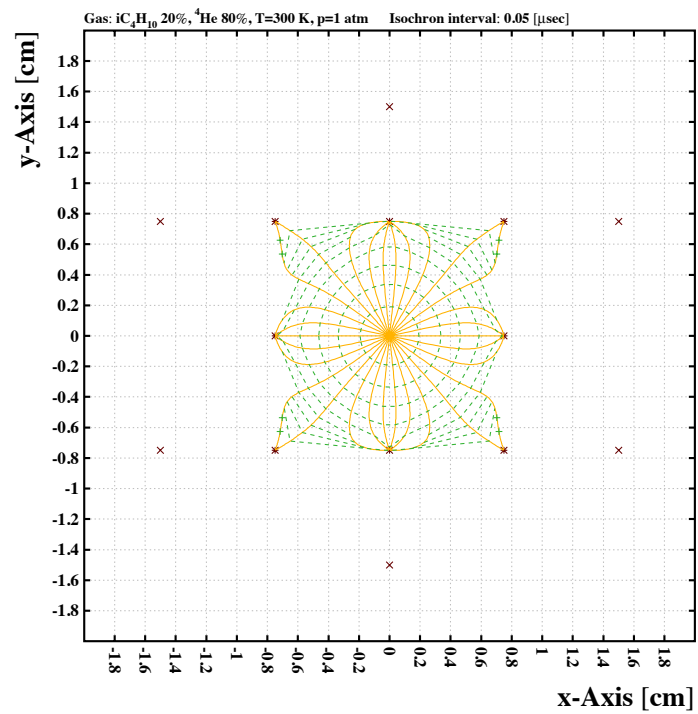
- Study the performance of Jean-Pierre's preamp prototype in a realistic beam environment with a full-length detector.
- Can we achieve the signal-to-noise and bandwidth performance required for cluster counting?
- Compare the ability to distinguish $e/\mu/\pi$ as a function of momentum using cluster counting and dE/dx .
- We are not studying tracking.

Detector prototype

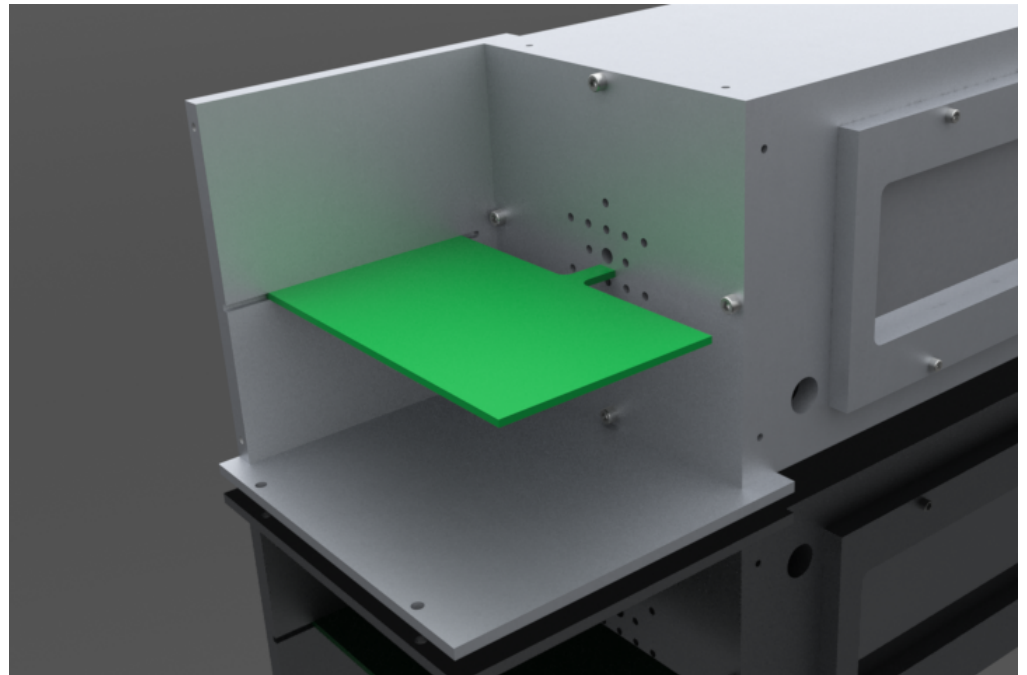
- 2.7m long, single cell.
- 15 mm x 15 mm square cell, 3:1 field/sense
 - 80 micron gold-plated aluminum field and bias wires. (Bare wire is on order). 86 g tension.
 - 25 micron gold-plated molybdenum sense wire. 27 g.
- Bias wires are adjusted to make the field map in the cell look like a large chamber.
- Field wires are grounded via board at preamp end.



Positron drift lines from a wire

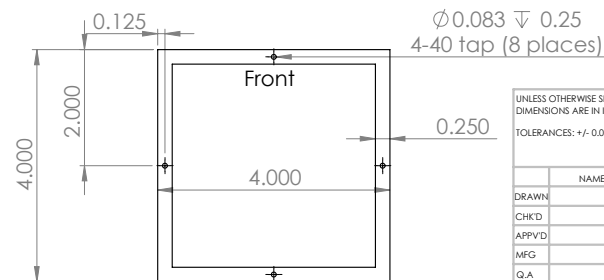
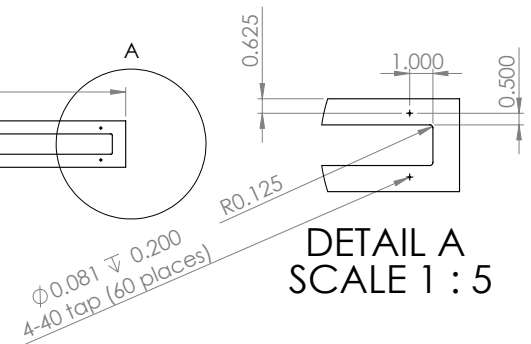
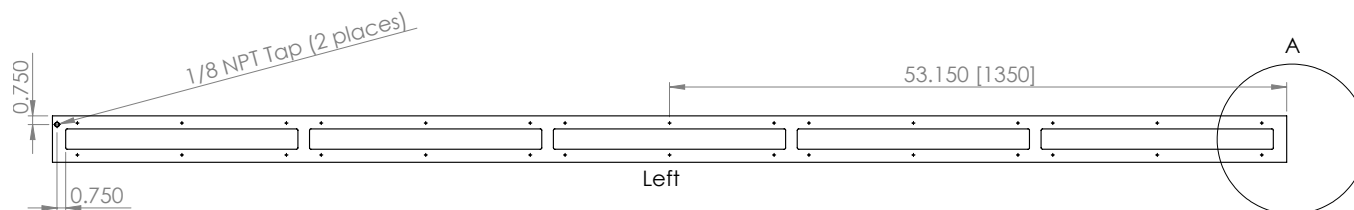
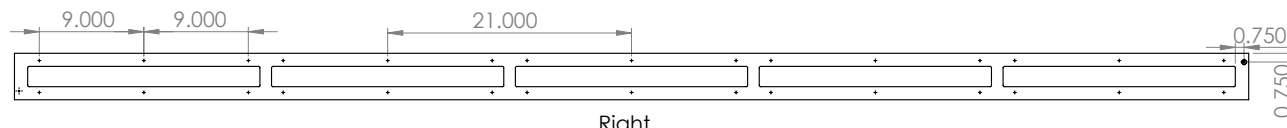


Plotted at 11:18:40 on 09/09/11 with Garfield version 7.33.



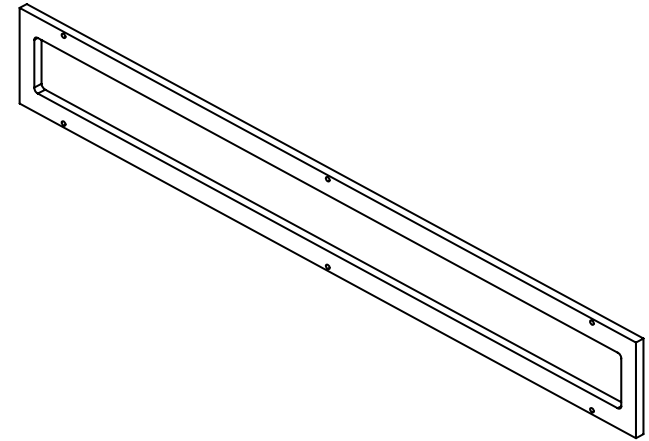






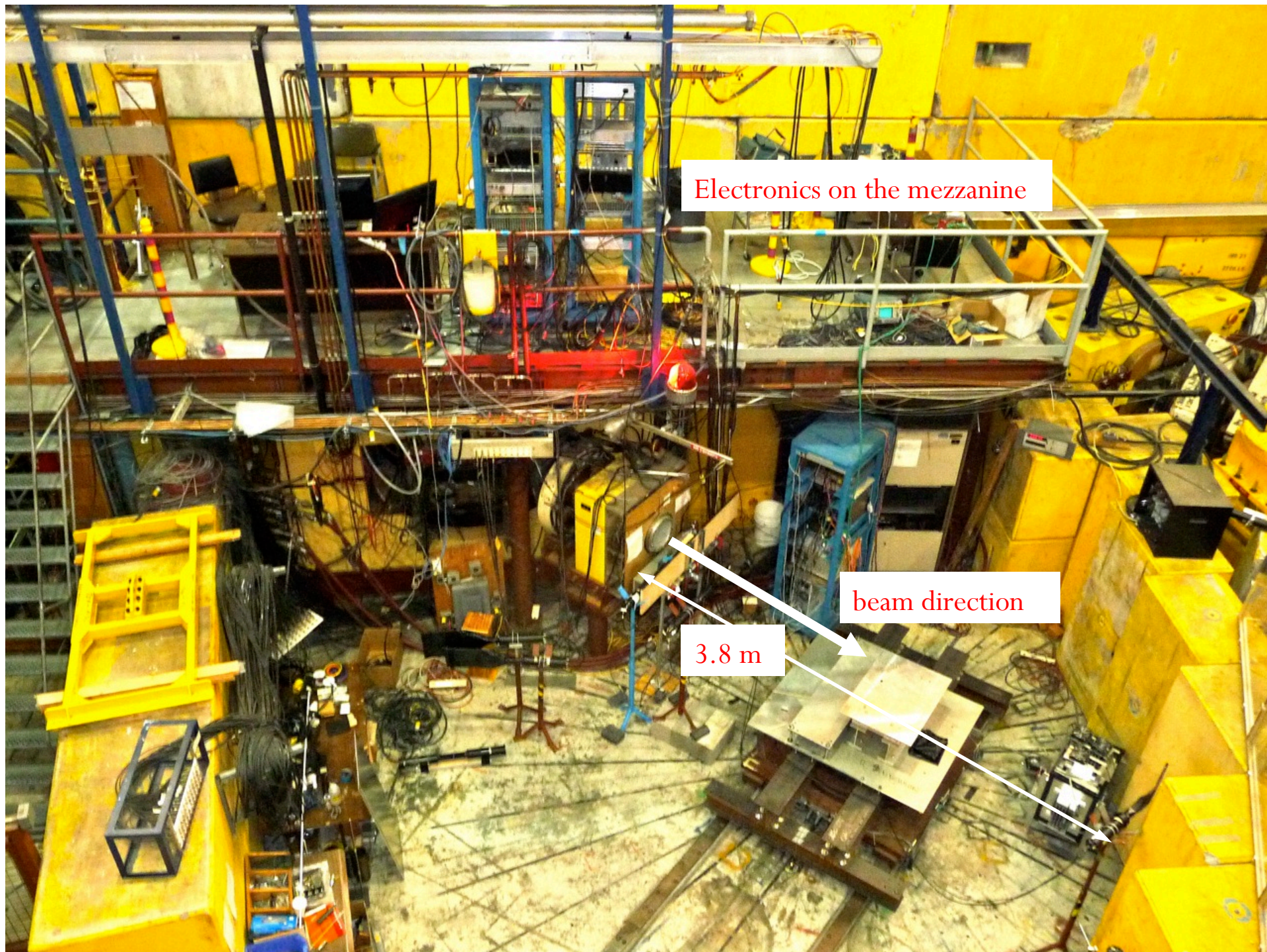
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: +/- 0.005"				FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION	
DRAWN:		NAME	SIGNATURE	DATE				TITLE:			
CHK'D											
APP'D											
MFG											
Q.A											
MATERIAL:						Aluminum		DWG NO.		Gas_Chamber	
WEIGHT:								SCALE: 1:20		SHEET 1 OF 1	

- 25 micron aluminum shim stock is glued over windows.
- Window frames ensure good electrical contact and stop glue from peeling.
- Frames are covered with 25 micron mylar to provide mechanical protection



M11 beam

- 62 – 400 MeV/c; e^+ , μ^+ , π^+ . Significant proton contamination above 300 MeV/c.
 - can also be operated in negative mode at lower rate
- 4 ns bunch every 44 ns
- Expect dozens of particles per second.
- Particle ID (discussed later) but no beam line tracking.

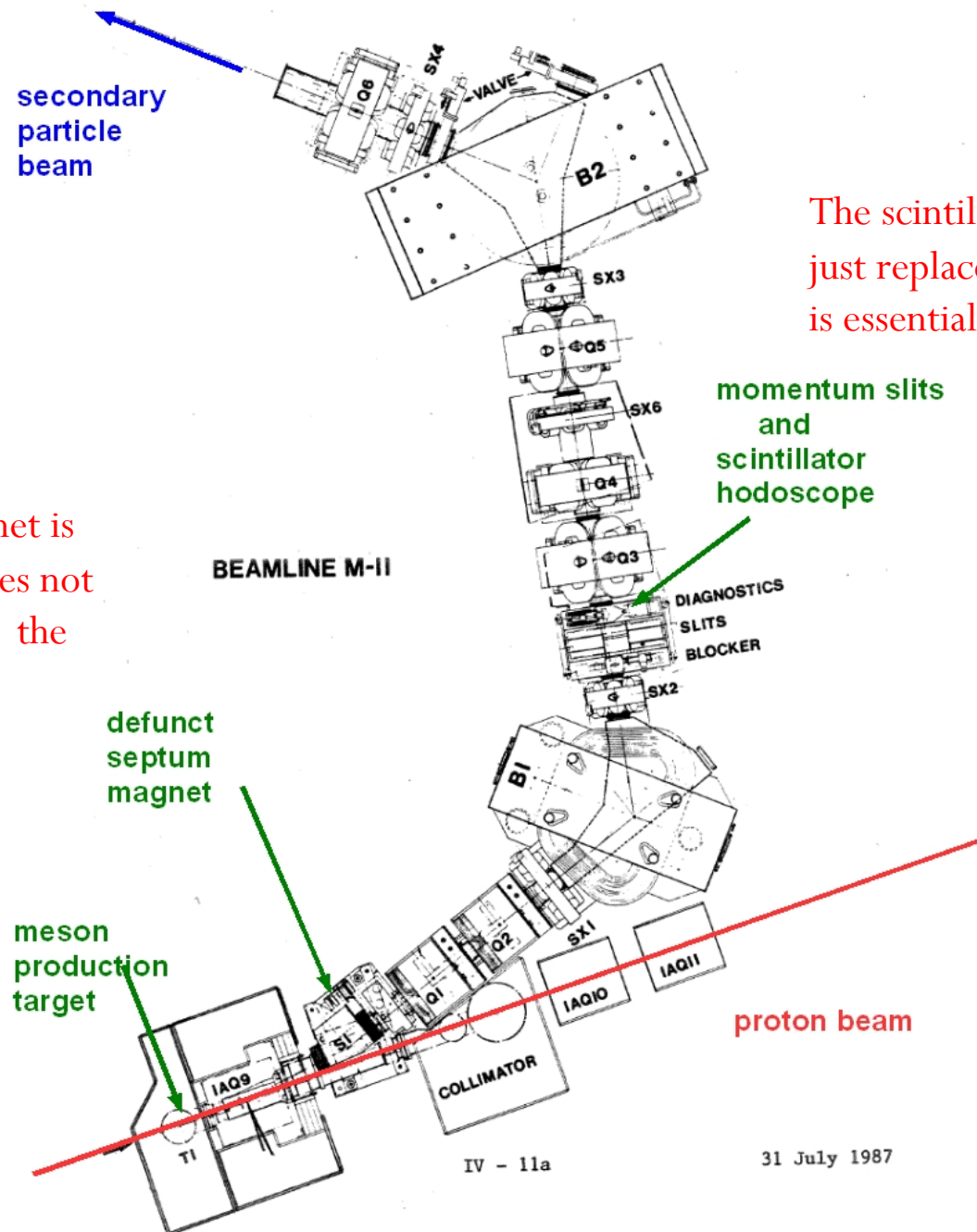


Electronics on the mezzanine

beam direction

3.8 m

Because the septum magnet is broken, the beam line does not see particles produced in the target, but rather in the downstream beampipe.



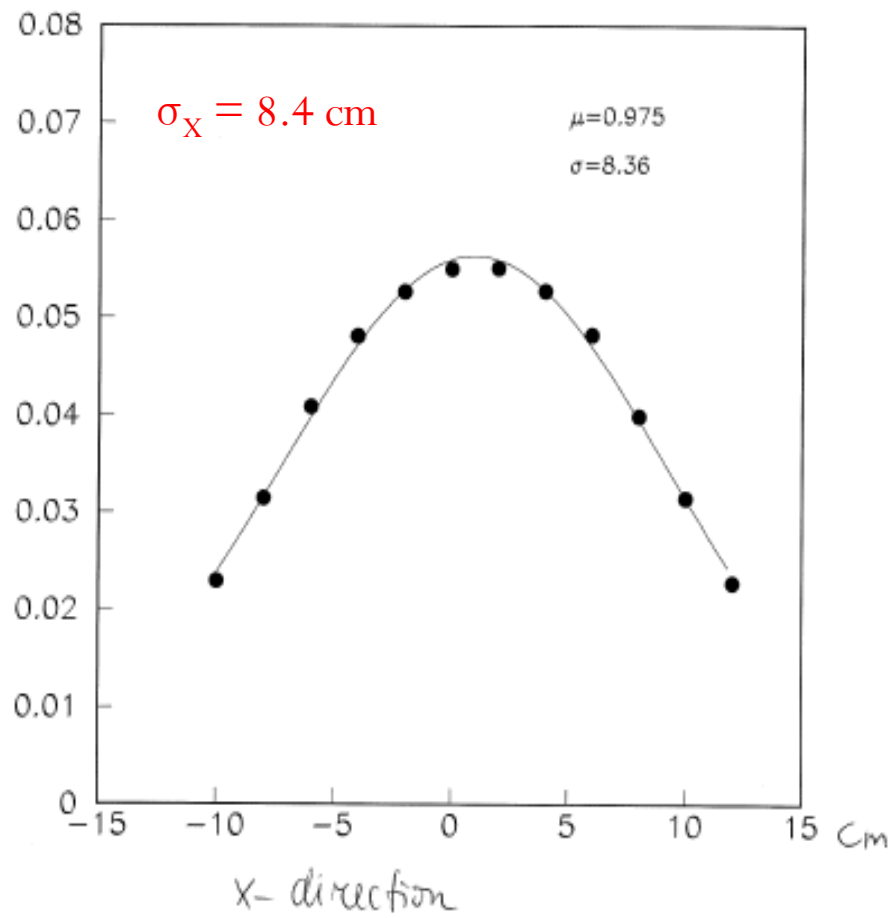
The scintillator hodoscope was just replaced, but the new one is essentially useless

momentum slits
and
scintillator
hodoscope

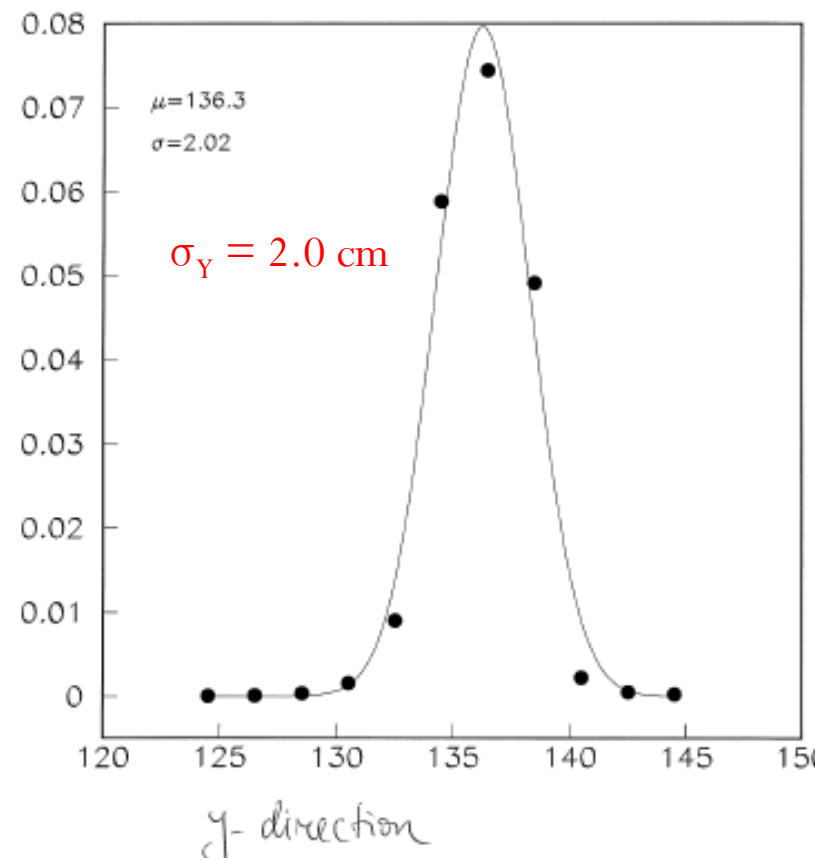
proton beam

31 July 1987

Beam x Scan

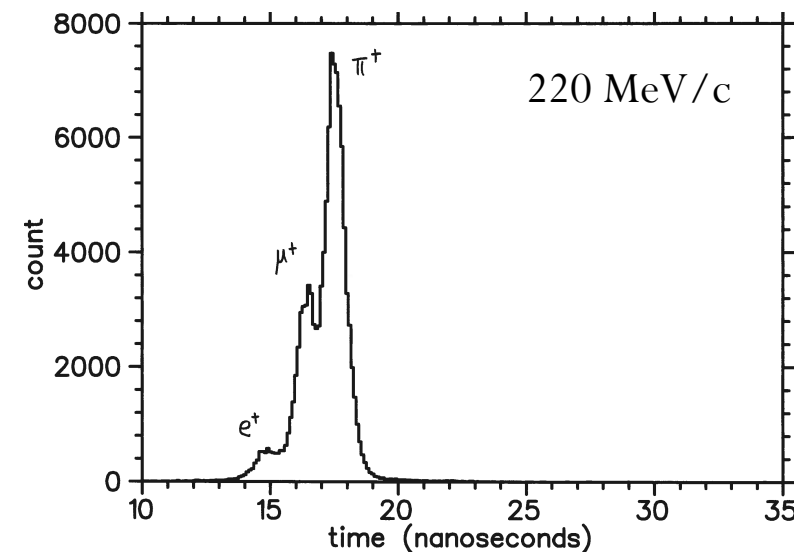
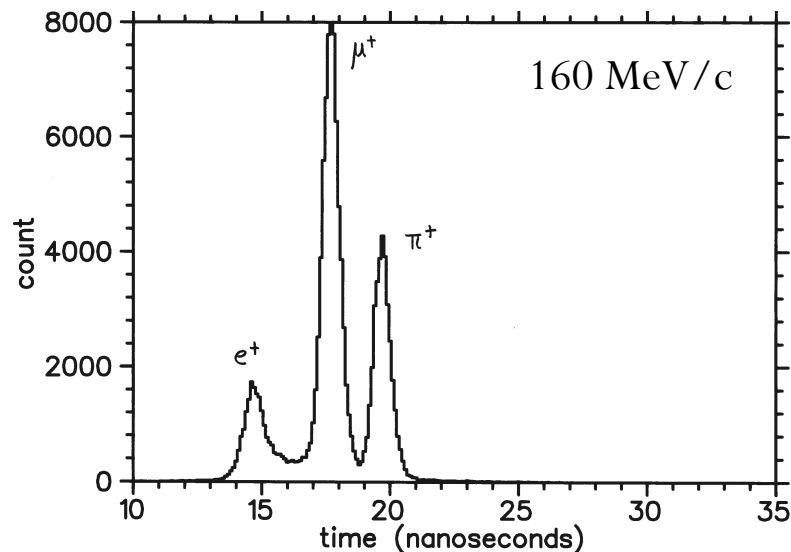
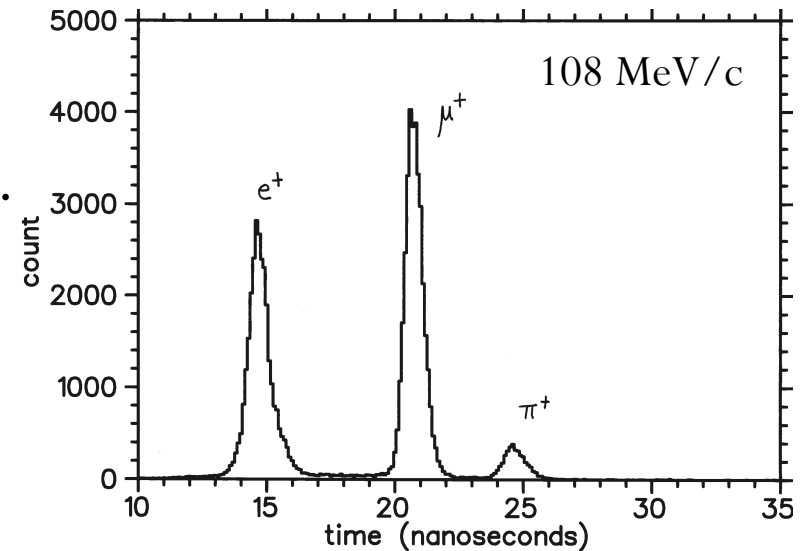


Beam y Scan



Beam line particle identification

- Primary method to identify beam particles is time of flight.
- Plots are for $L = 4.43$ m; only 3.8m is now available.

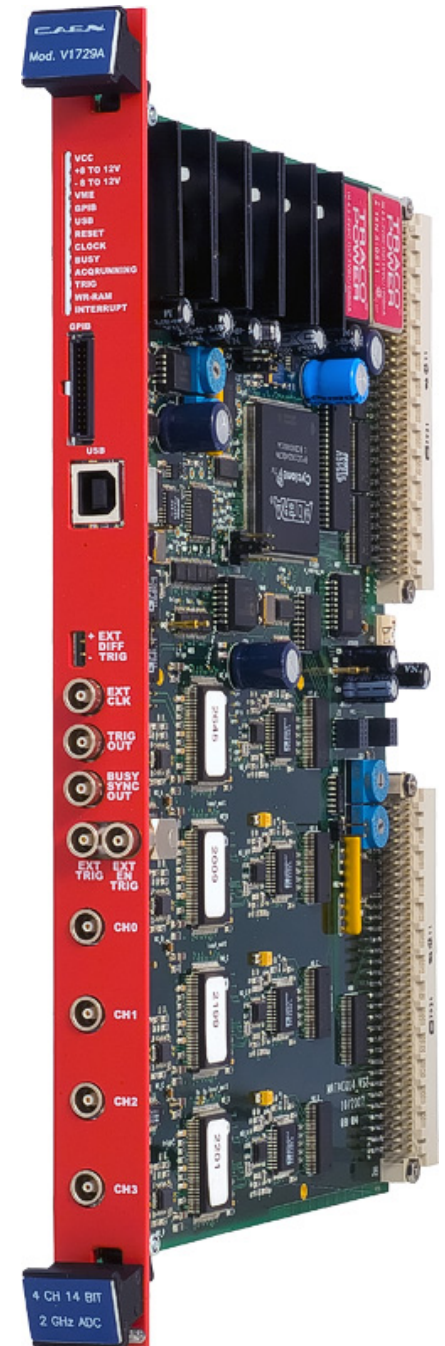


TOF continued

- Will also try using beam pickoff located near target.
 $L = 15$ m. However:
 - Bunch length $\Rightarrow \sigma \approx 4/\sqrt{12} = 1.2$ ns
 - The actual source of the beam particles (i.e. flight path) is not known, and may not be a point source.
- New Cherenkov detector has been installed which helps μ/π separation around 250 MeV/c
- New scintillator at the momentum slits is useless.

DAQ

- Existing MIDAS DAQ has VME TDC and ADCs for scintillator paddles (as well as necessary trigger logic).
- We will use CAEN V1729 switched capacitor array for digitization. Code exists to incorporate it into MIDAS.
 - 4 channel, 14 bit, 2 GigaSample/s
- Intend to include some temperatures and atmospheric pressure as well.



Other items

- Gas system exists for M11; should be no problem to get He:Iso 80:20 and 90:10.
- Do we want to run on any other gases?
- Maybe use stand shown in photo for mechanical support.

Plans

- Stringing is probably complete. Complete windows and test gas tightness by end of next week.
- Operate initially with the (slow) Ortec 142 amplifier that we normally use with the aging chamber to check Fe55 spectrum.
- Run is tentatively scheduled Nov 15 – Dec 5, including set up time and three beam maintenance days.
- However, the adjacent beam line has developed a leak. It will cost 4 weeks running time if this needs to be repaired before the December shut down.

Run plan

- Or rather, ideas towards a run plan:
 - 5 momenta
 - 5 locations along the wire
 - 2 gases
 - 3 HV
 - 5 dip angles
- M11 will be dismantled after 2012 run for installation of ultra-cold neutron experiment.